Course analysis

FCB3002 Higher Seminar in Industrial Biotechnology II

Course name: Higher Seminar in Industrial Biotechnology II	Cycle: 3
Course code: FCB3002	ECTS credits: 3,0
Term: VT20+HT20	Study period: P1-P4
Course coordinator: Christina Divne	Examiner: Christina Divne
Number of new students enrolled this year: 3	Number of students finishing this year: 3
Degree of examination (%): 100	Degree of achievement (%): 100
Answer frequency LEQ (%): 71 (5 of 7 of all participants regardless of year)	

1. About the course

The course series including courses FCB3001-FCB3004 was established spring 2019, and replaced the previous course series FBB3330-FBB3360 that had been running 2014-2019.

The seminar course series for doctoral student "Higher Seminar in Industrial Biotechnology" (course codes FCB3001, FCB3002, FCB3003, FCB3004, for years 1-4 respectively, 3.0 ECTS each) focuses on critical analysis of published research within the broader field of biotechnology as well as in more specialized fields of research. Whenever possible, the students also present and critically analyze each other's manuscripts, which can be at any stage of completion.

The four courses cover the full extent of the third-cycle education. The courses are examined as a single module through by 80 percent active attendance. As part of the attendance criterion, three mandatory tasks are required: presence, presentation of own manuscript or article, critical review and discussion on manuscripts/articles presented by other students.

When doctoral students work with their own manuscripts, the manuscripts can be at any stage from preliminary draft to revision stage with existing review comments. For students that have not yet authored a manuscript draft, published articles in varying fields of biotechnology (with focus on the students research areas, i.e., bioprocess technology, metabolic engineering, enzyme engineering, and structural biology) are discussed.

Each course (3.0 ECTS) spans one year with two sessions per month, and the students can start at any time during year. Typically, each student presents at two sessions per year, but all students take part in active in-depth review and analysis.

2. Pedagogical approach

The presenting student emails the reading material (manuscript or article) to all students one week before the course session. All other students prepare a careful review and critical analysis before the course session.

During the course session, the presenter summarizes the contents of the manuscript/article in the form of an oral presentation supported by lecture slides. Discussions regarding all aspects of the manuscript/article (layout/disposition, language, data presentation, data analysis, conclusion etc) take place during and after the presentation. All students are encouraged to ask questions, reflect and discuss.

The learning outcomes are coupled to several of the Higher Education Ordinance's examination objectives for doctoral and licentiate degree, more specifically:

ILO1: Links to Higher Education Ordinance's degree objectives A1 and A2 for doctoral degree, and A1 for licentiate degree.

ILO2: Links to Higher Education Ordinance's degree objectives B1, B2, B4, B5 and B6 for doctoral degree, and B1 and C3 for licentiate degree.

ILO3: Links to Higher Education Ordinance's degree objectives B3 and B4 for doctoral degree, and to B2 for licentiate degree.

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ILO4: Links to Higher Education Ordinance's degree objectives C1, C2 for both degrees, including KTH's local sustainability goal.

3. Student throughput and group composition

   As of December 2020, the seminar series enrolled a total of 8 doctoral students distributed over the four courses (but all students study together): 1 student FCB3001 (year 1), 2 students FCB3002 (year 2), 3 students FCB3003 (year 3), and 2 student FCB3004 (year 4).

4. Changes made before this course offering (based on the analysis 2019 and the Covid-19 pandemic)

   - Due to the pandemic, the course was given online via zoom during the period March-December.
   - Course evaluation was fully anonymous and completed in Canvas.
   - Improve attendance for sessions where articles outside own research are being discussed.

5. Summary of the student's course evaluations (LEQ) 2020

   Positive aspects:

   The course series is appreciated by the doctoral students. They feel that the in-depth discussions concerning their manuscripts are rewarding, and help them think critically about their own and others' writing style, data presentation, and analysis. Importantly, the students feel that the atmosphere is inclusive and relaxed in a way that supports the intended learning outcomes. The students feel that knowledge about the whole publication process is very important. The spider diagram (appendix 1) displays scores for 11 questions, where +2 means, "strongly agree", –2 "strongly disagree", and 0 is "neither agree or disagree". Any number >0 is a positive response to a statement.

   The students were overall positive (scores in the range +1 to +2), especially questions 1, 5, 6, 7, and 10.

   1. *The course helped me to learn about new topics within the field of Biotechnology to get a broader perspective.*
   5. *I had the possibility to practice critical analysis and evaluation.*
   6. *I had the possibility to learn about academic writing and academic authorship, and the publishing process.*
   7. *I had the possibility to discuss ethical issues related to scientific writing and publishing research results.*
   10. *I consider the course useful for my research project.*

   Aspects that can be improved:

   The questions 2 and 4 scored lower, but still on the positive scale (i.e. >0).

   2. *The course helped me to obtain specialized knowledge in my own research area.*

      The reason for the low score has to do with the relatively low number of students and their scientifically diverse background. Industrial Biotechnology includes a wide range of topics and depending on the students' research projects, some research topics may appear more frequently. For a given paper, there may not be enough students specialized in that specific research area. The composition of students varies over time, and sometimes the group is more homogeneous and at other times less so.

   4. *I spent time thinking about how to present research in a pedagogical way when preparing presentations.*

      This indicates that the students do not spend enough time on the pedagogical aspect of the presentations. The presentations are quite pedagogical and well adapted for a non-expert audience, and for more senior students the pedagogical skills usually increase. Nonetheless, the result suggests that the students would benefit from raising their own awareness of, and paying more attention to, actively thinking about the pedagogical aspects when preparing the

presentations. It also calls for a discussion on whether the course needs more content about pedagogical aspects.

6. Follow-up meeting and plans for course development during 2021

   On February 5, 2021, the results of the course evaluation were presented to the students, followed by a discussion of how to further improve the course. The course design and execution are not in need of any major revision, but some of the points in the course evaluation deserved to be raised. These points specifically apply to those sessions when published articles are presented, and not when the students' own manuscripts are being discussed. More specifically, the following points were discussed:

   1) We discussed the point about pedagogical training, and the students interpret the results as people in general not spending enough time thinking about this aspect. The students agree on giving this some more thought in the future, especially when published articles are presented. Suggestions to include slides that explain more clearly/pedagogically various aspects discussed, such as why an article was chosen, why it was written/published, as well as more specialized content.
   2) A point that was brought up also in the previous course development meeting related to how to bridge the gaps between the students' knowledge/research areas. There is a tendency for students to be less active in sessions where topics outside of their own research area are discussed. While this is not surprising for a student group studying very different research problems, it is important to remember that the research projects are all relevant for the third-cycle subject that the students are admitted to (Biotechnology), as well as the department activities (Industrial Biotechnology), but the projects can be more or less closely connected to a future industrial application. There is no easy solution to this issue, and it need not be a problem if everyone tries to be a bit more prepared and engaged also for the sessions presenting work outside his or her area.
   3) One point that was raised related to the relevance of the selected articles, and a suggestion was made that the mentor should check each selected article to make sure it is relevant for industrial biotechnology. To this suggestion, I responded that I don't want to act as a gate keeper to steer the choice of articles, but the students need to make an effort themselves to evaluate whether a certain article is relevant for the group. It is no problem to select an article that is outside the mainstream industrial biotechnology track, but one should be able to motivate the possible benefits for the group to read and discuss the article, and it is advisable to not always select articles that can be perceived as "non-relevant". Still, it is important to remember that to broaden the scientific horizon is included in the degree objectives, and often prove very useful and advantageous later on, especially after graduation.
   4) Another point that was raised last year was whether we should have one student acting as moderator/opponent. While this is not a bad idea, the risk is that the other students who are not moderating at that session come to the meeting unprepared and remain inactive. The requirement of passing the course is active attendance on 80% of the 18 sessions during a year (keyword: active attendance, which means being prepared to ask questions, discuss and critically analyze the material being presented).

7. Suggestion for changes for the next course offering

   - From 2021, the course will use Canvas.
   - Due to the continuing pandemic, the course will be given online in zoom until the restrictions on in-person teaching are lifted.
   - Increase efforts to present material in a pedagogical way to non-experts.
   - It is fine to select articles that are outside or bordering to the mainstream track, but requires increased effort on explaining how the content can benefit the audience's broader knowledge and proper efforts to present the content in a pedagogical way.
   - A 5th course in the seminar series (FCB3005) will be established to allow students who have up to 20% departmental duty (e.g. teaching etc.) to follow the seminars during the entire education.

Appendix 1.

Course evaluation (LEQ) 2020

1. Summary of quantitative aspects from the LEQ

	Questions
1	The course helped me to learn about new topics within the field of Biotechnology to get a broader perspective
2	The course helped me to obtain specialized knowledge in me own research area
3	I had the possibility to practise presenting research results (own and others) during the course
4	I spent time thinking about how to present reserach in a pedagogical way when preparing presentations
5	I had the possibility to practice critical analysis and evaluation
6	I had the possibility to learn about academic writing and academic authorship, and the publishing process
7	I had the possibility to discuss ethical issues related to scientific writing and publishing research results
8	I had the possibility to discuss and learn about sustainability through discussions and own reflection
9	I felt comfortable discussing in an open, inclusive and non-judgemental environment
10	I consider the course useful for my research project
11	I consider the course useful for my education

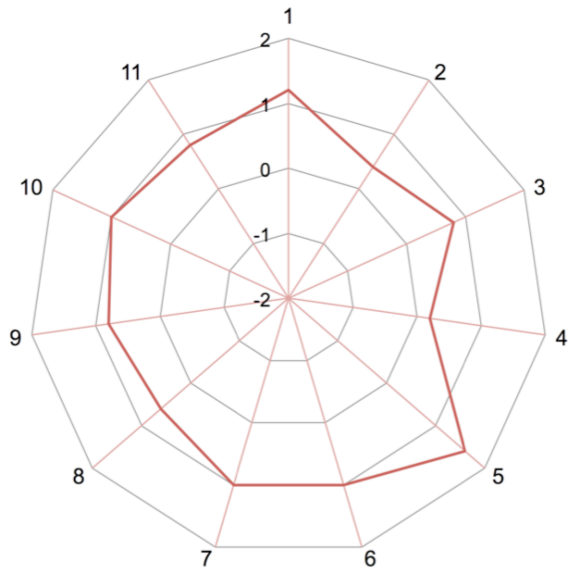

Figure 1. LEQ questions and spider diagram. Note that only answers from 5 students including all course levels (years 1-4) are plotted. For the purpose of integrity, it is not possible to ask which course in the series the student is enrolled in. Since only 5 students answered the survey in Canvas, the students' comments are more useful than the spider diagram.

What was the best aspect of the course ?

- From my point of view the critical analysis are defiantly very important and make up for the most educational aspect. I also very much enjoy the interaction with the other PhD students.
- The best aspect of the course is the socialization in a non-judgmental environment. By now we all know each other and I am not scared of talking anymore, so it is a nice feeling, it helps to reach the learning outcomes more easily. This entangles with all the other aspects of the course, so it is essential.
- You truly read the paper you are presenting in depth and with attention to detail, more so perhaps than when you read papers "just for yourself".
- Having the chance to present your own manuscript and comments by review from others to improve it.

What can be improved in the course ?

- Sometimes I have problems with the large diversity of the course, which is obviously also a positive aspect. But to explain my point; sometimes it is very difficult to have critical analysis if the topic is so far form once own topic. I understand that this is an issue which is related to the composition of the department. However, that does not change the fact that the discussion about papers far from once own topic can be very dull and the contribution to the scientific discussion is very limited.

- There is always the problem of lack of participation, especially when certain topics are treated. But I guess there is not much to do about it, and it is mostly due to the temporary low number of students in the course. Once we talked about having a designated opponent, maybe we can discuss this all together again, I don't remember why we didn’t consider the idea.
- Narrow the gap between plan 1 and plan 2. topics are wildly different between floors and it shows during discussion as people from the floor other than the presenter's are more passive during discussion. How to do this though?
- It is a seminar course for topics in industrial biotechnology, and sometimes I have the feeling that the chosen articles do not belong in this area, thus I suggest that the teacher checks the selected articles if they belong to the area of industrial biotechnology before they are being presented and discussed in the seminar.

Other comments ?

- I think the course is by far one of the best PhD course offered by KTH. And thank you Christina for taking the time to also discuss on topics which are behind the scope of a plain literature review.
- Having the canvas for this course will make a difference. It is cool.